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Nobutani et al.

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(54) **PROCESSING APPARATUS, MOBILE DEVICE, AND NON-TRANSITORY COMPUTER READABLE MEDIUM STORING AUTHENTICATION REQUEST PROGRAM**

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CPC ***H04N 1/4433*** (2013.01); ***H04N 1/00204*** (2013.01); ***H04N 1/4413*** (2013.01);
(Continued)

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CPC H04L 2209/56; H04L 2209/805; H04L 2463/102; H04L 63/0853; H04L 63/0861; H04L 9/3231
See application file for complete search history.

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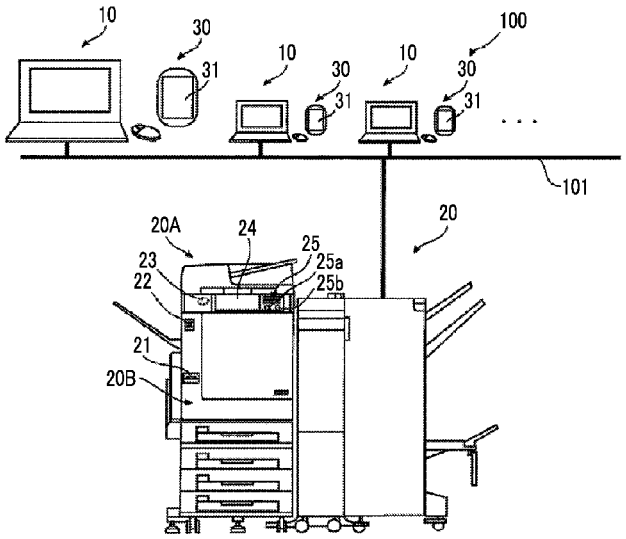
(57) **ABSTRACT**

A processing apparatus includes: a process execution unit that executes a process according to a user instruction; a first communication unit that performs wireless communication with a mobile device moved in a predetermined communication area; a recognition unit that recognizes existence/non-existence of use intention; an authentication processing unit that executes a user authentication process in cases where the first communication unit receives a user ID maintained in the mobile device and the recognition unit recognizes that the user who possesses the user ID attempts to cause the process execution unit to execute the process; and a process execution permission unit that permits the process execution unit to execute the necessary authentication process in a case where the reception user ID is recognized as the user ID possessed by the user who has the authority to cause the process execution unit to execute the necessary authentication process.

14 Claims, 13 Drawing Sheets



(52) **U.S. Cl.**
CPC ... ***H04N 1/4426*** (2013.01); *H04N 2201/0039* (2013.01); *H04N 2201/0055* (2013.01); *H04N 2201/0084* (2013.01); *H04N 2201/0094* (2013.01)

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FIG. 1

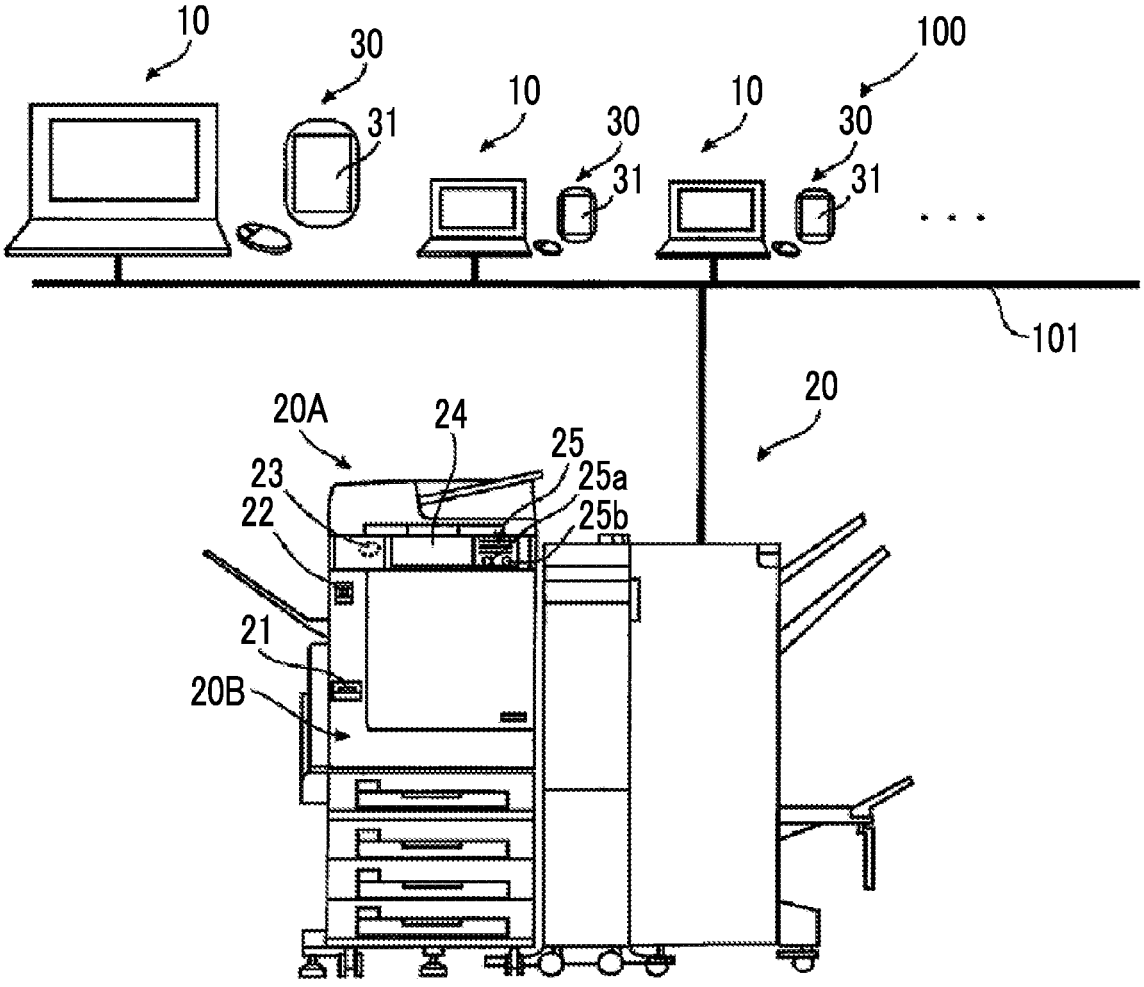


FIG. 2

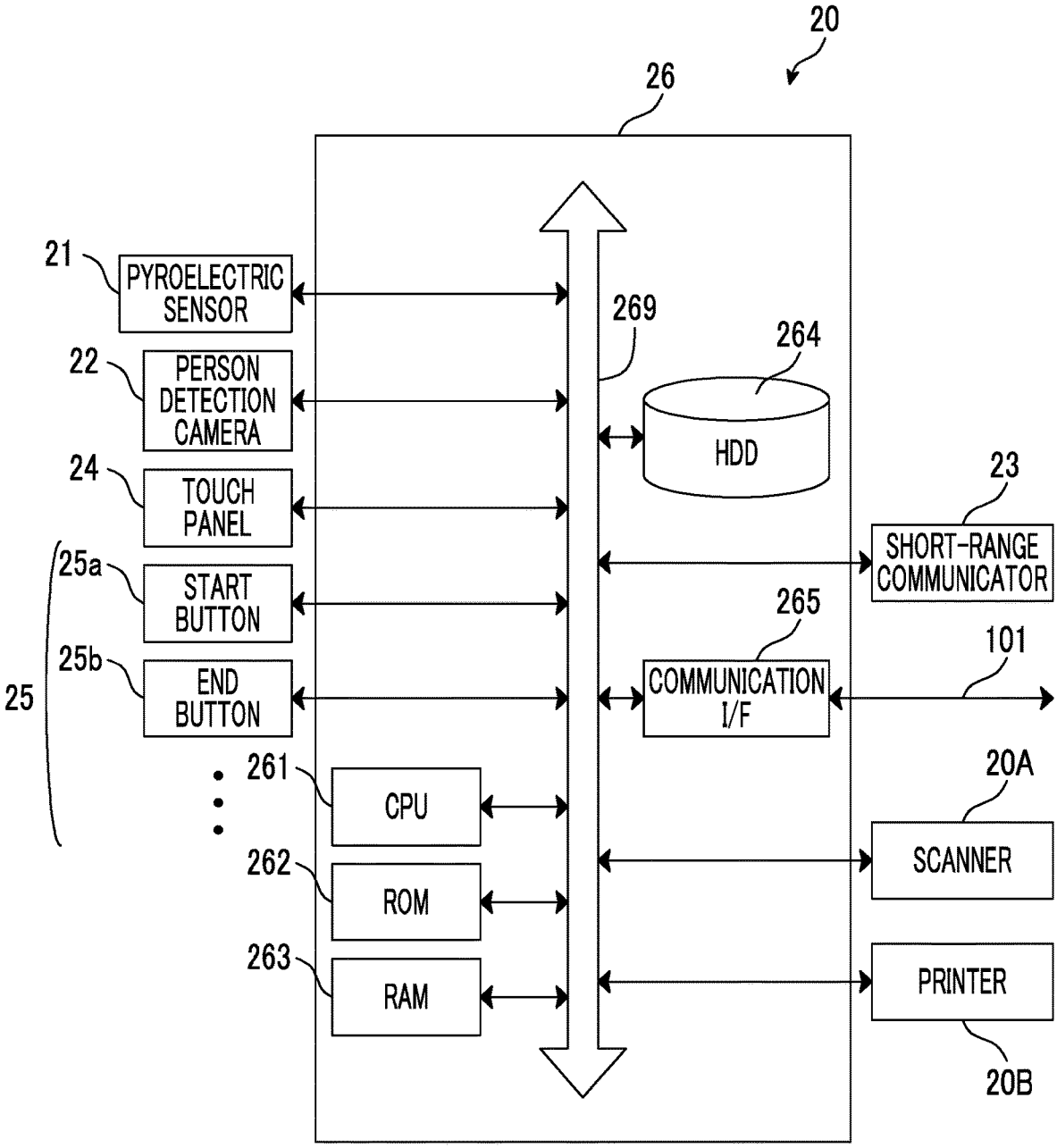

20
26
21
PYROELECTRIC SENSOR
22
PERSON DETECTION CAMERA
24
TOUCH PANEL
25a
START BUTTON
25b
END BUTTON
25
261
CPU
262
ROM
263
RAM
269
264
HDD
23
SHORT-RANGE COMMUNICATOR
265
COMMUNICATION I/F
101
20A
SCANNER
PRINTER
20B

FIG. 3

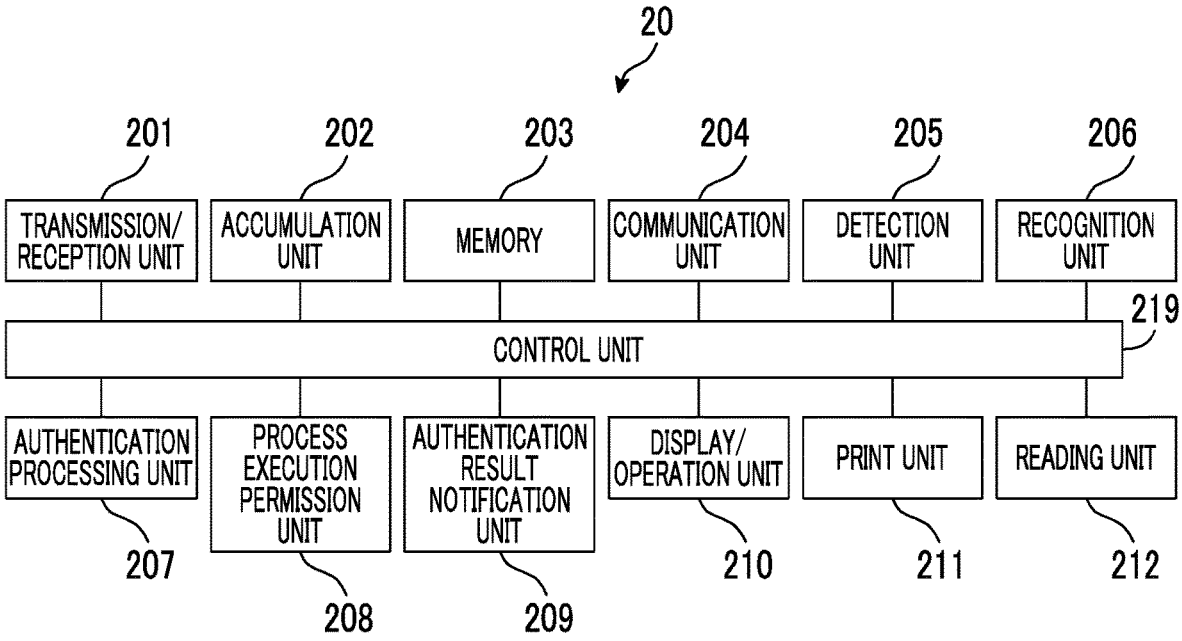

20
201
202
203
204
205
206
TRANSMISSION/ RECEPTION UNIT
ACCUMULATION UNIT
MEMORY
COMMUNICATION UNIT
DETECTION UNIT
RECOGNITION UNIT
219
CONTROL UNIT
AUTHENTICATION PROCESSING UNIT
PROCESS EXECUTION PERMISSION UNIT
AUTHENTICATION RESULT NOTIFICATION UNIT
DISPLAY/ OPERATION UNIT
PRINT UNIT
READING UNIT
207
208
209
210
211
212

FIG. 4

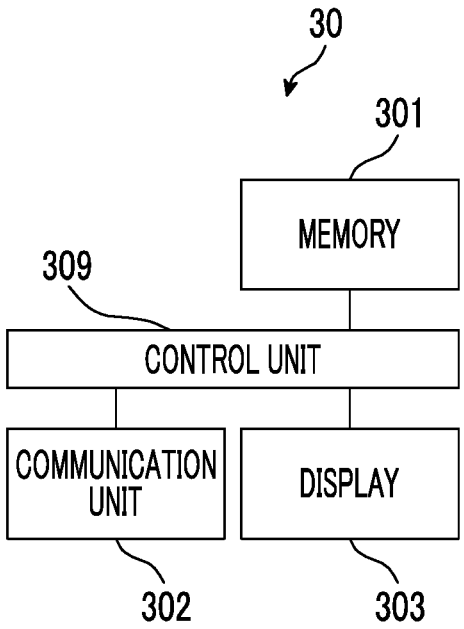

30
301
MEMORY
309
CONTROL UNIT
COMMUNICATION UNIT
DISPLAY
302
303

FIG. 5

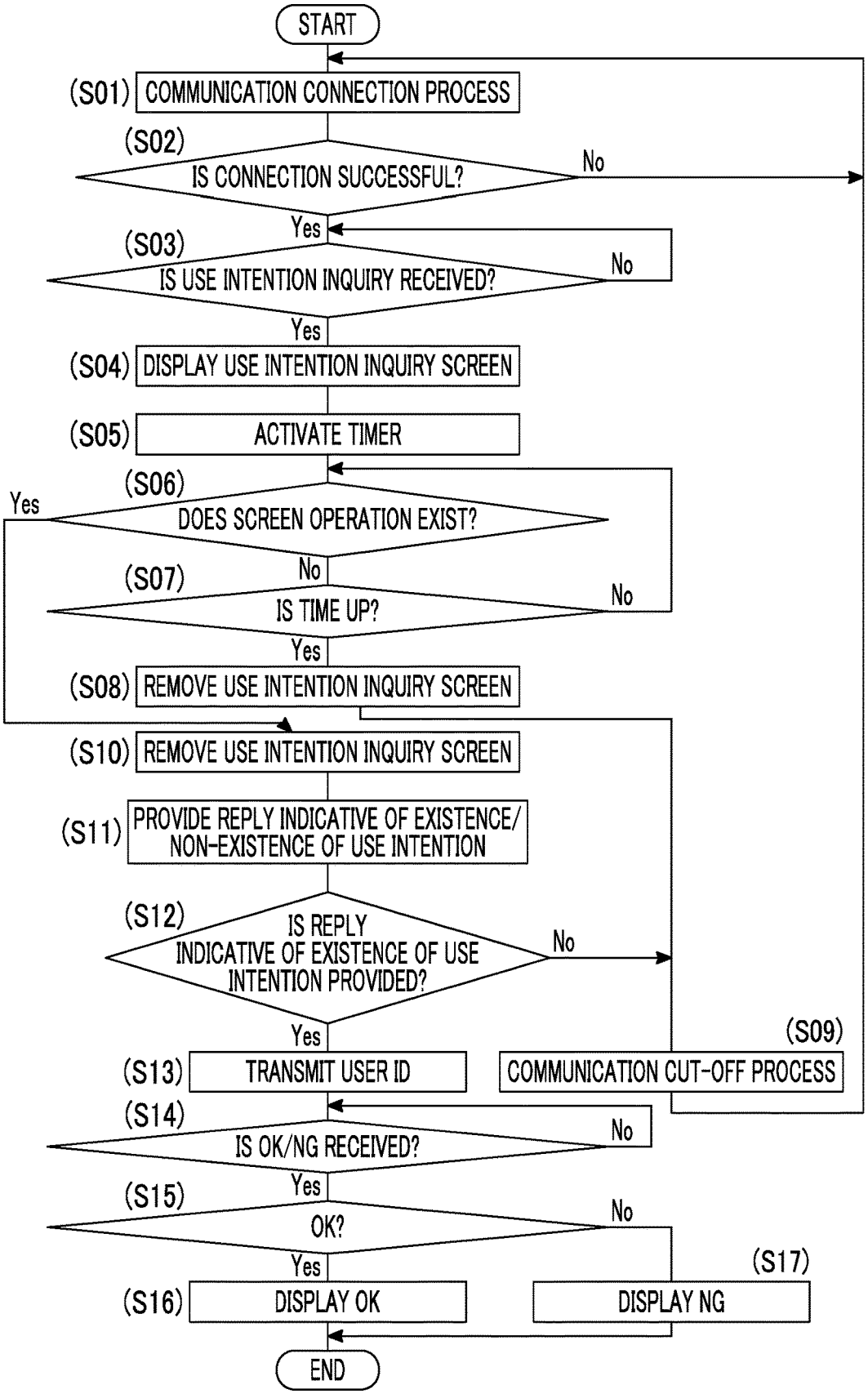

START
(S01)
COMMUNICATION CONNECTION PROCESS
(S02)
IS CONNECTION SUCCESSFUL?
No
Yes
(S03)
IS USE INTENTION INQUIRY RECEIVED?
No
Yes
(S04)
DISPLAY USE INTENTION INQUIRY SCREEN
(S05)
ACTIVATE TIMER
(S06)
Yes
DOES SCREEN OPERATION EXIST?
No
(S07)
IS TIME UP?
No
Yes
(S08)
REMOVE USE INTENTION INQUIRY SCREEN
(S10)
REMOVE USE INTENTION INQUIRY SCREEN
(S11)
PROVIDE REPLY INDICATIVE OF EXISTENCE/ NON-EXISTENCE OF USE INTENTION
(S12)
IS REPLY INDICATIVE OF EXISTENCE OF USE INTENTION PROVIDED?
No
Yes
(S09)
(S13)
TRANSMIT USER ID
COMMUNICATION CUT-OFF PROCESS
(S14)
IS OK/NG RECEIVED?
No
Yes
(S15)
OK?
No
Yes
(S17)
(S16)
DISPLAY OK
DISPLAY NG
END

FIG. 6

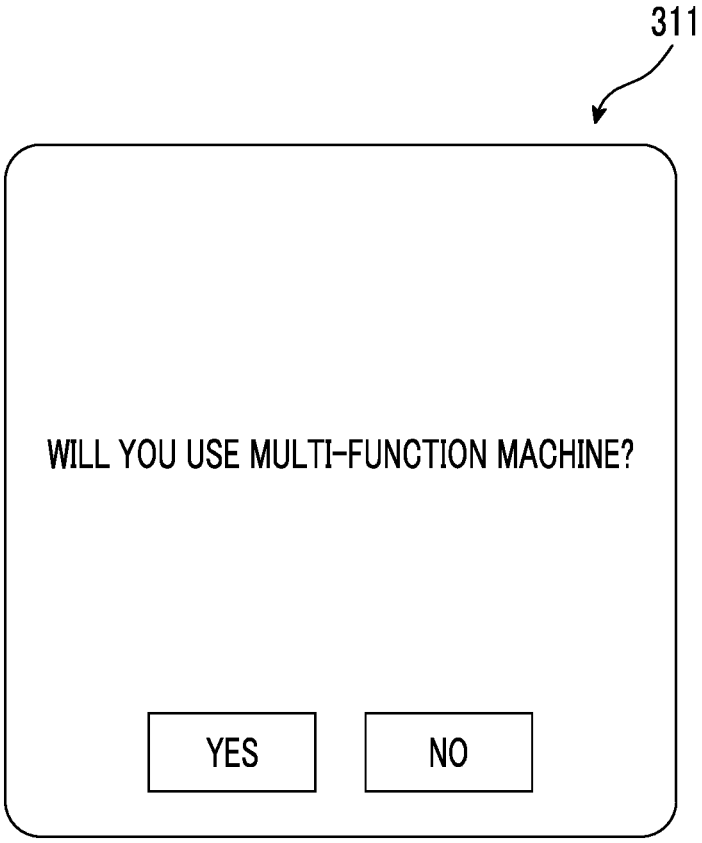


FIG. 7

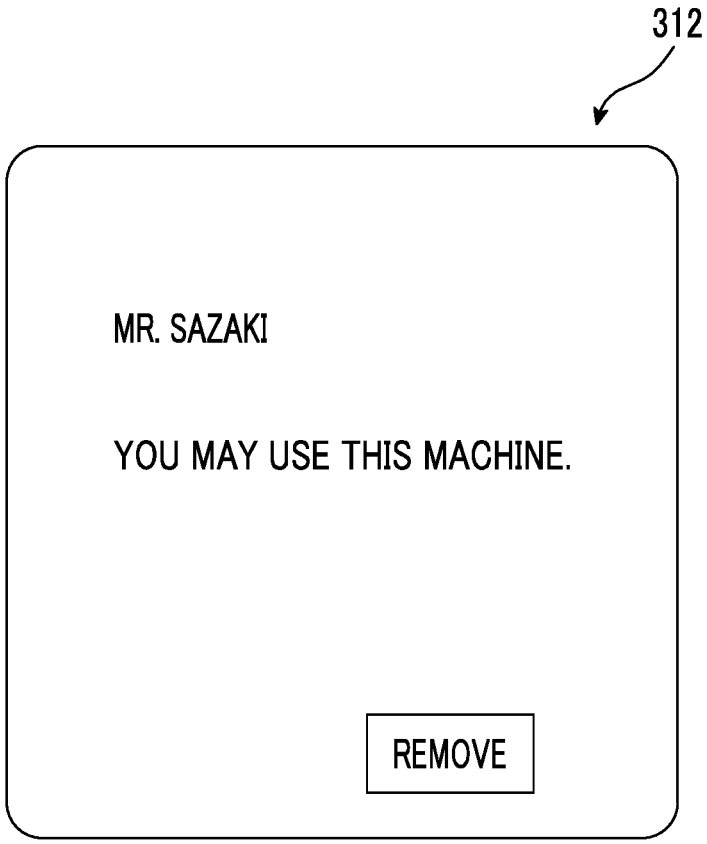


FIG. 8

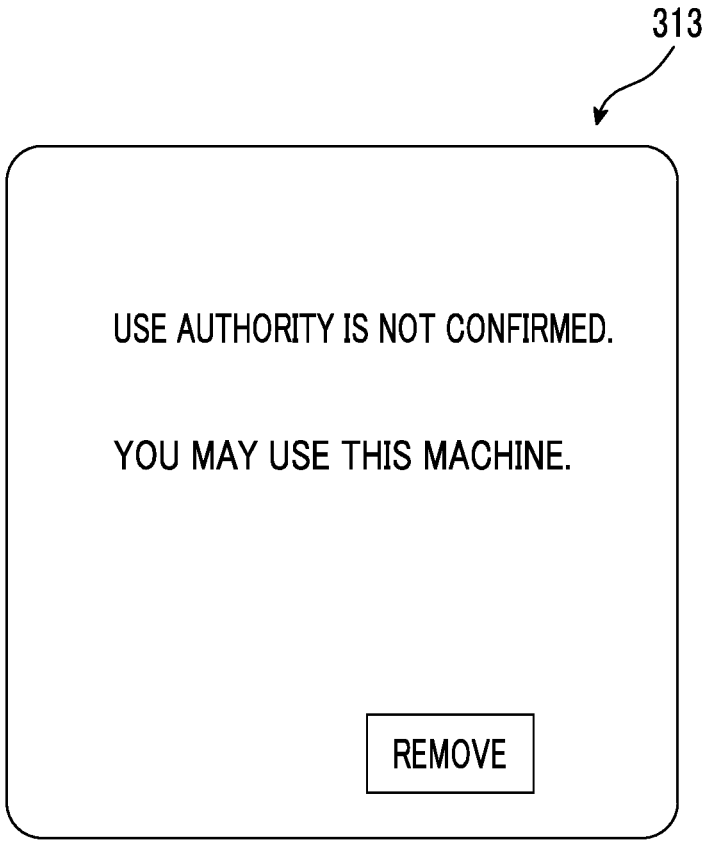

313
USE AUTHORITY IS NOT CONFIRMED.
YOU MAY USE THIS MACHINE.
REMOVE

FIG. 9

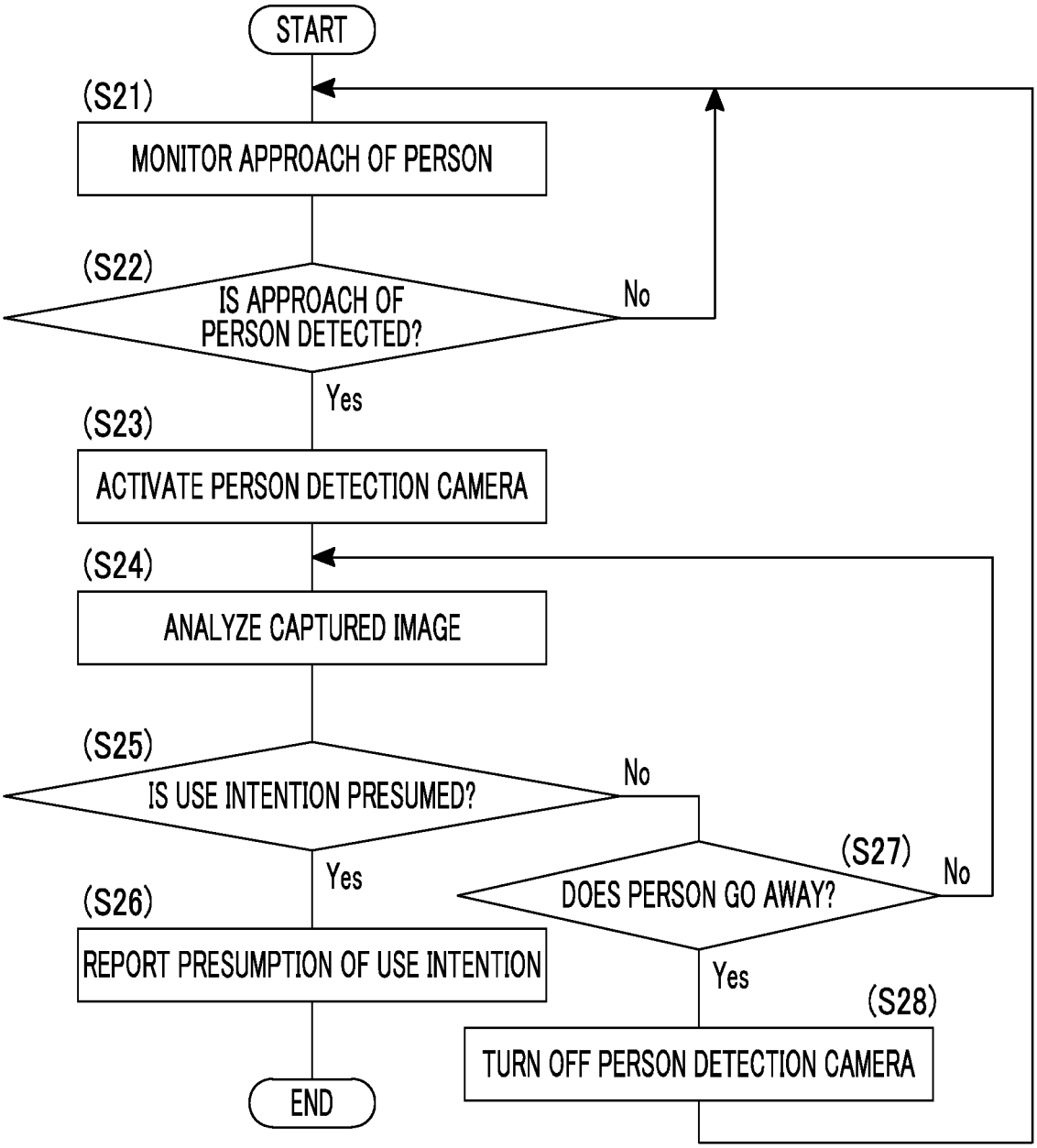

START
(S21)
MONITOR APPROACH OF PERSON
(S22)
IS APPROACH OF PERSON DETECTED?
No
Yes
(S23)
ACTIVATE PERSON DETECTION CAMERA
(S24)
ANALYZE CAPTURED IMAGE
(S25)
IS USE INTENTION PRESUMED?
No
Yes
(S27)
DOES PERSON GO AWAY?
No
Yes
(S26)
REPORT PRESUMPTION OF USE INTENTION
(S28)
TURN OFF PERSON DETECTION CAMERA
END

FIG. 10

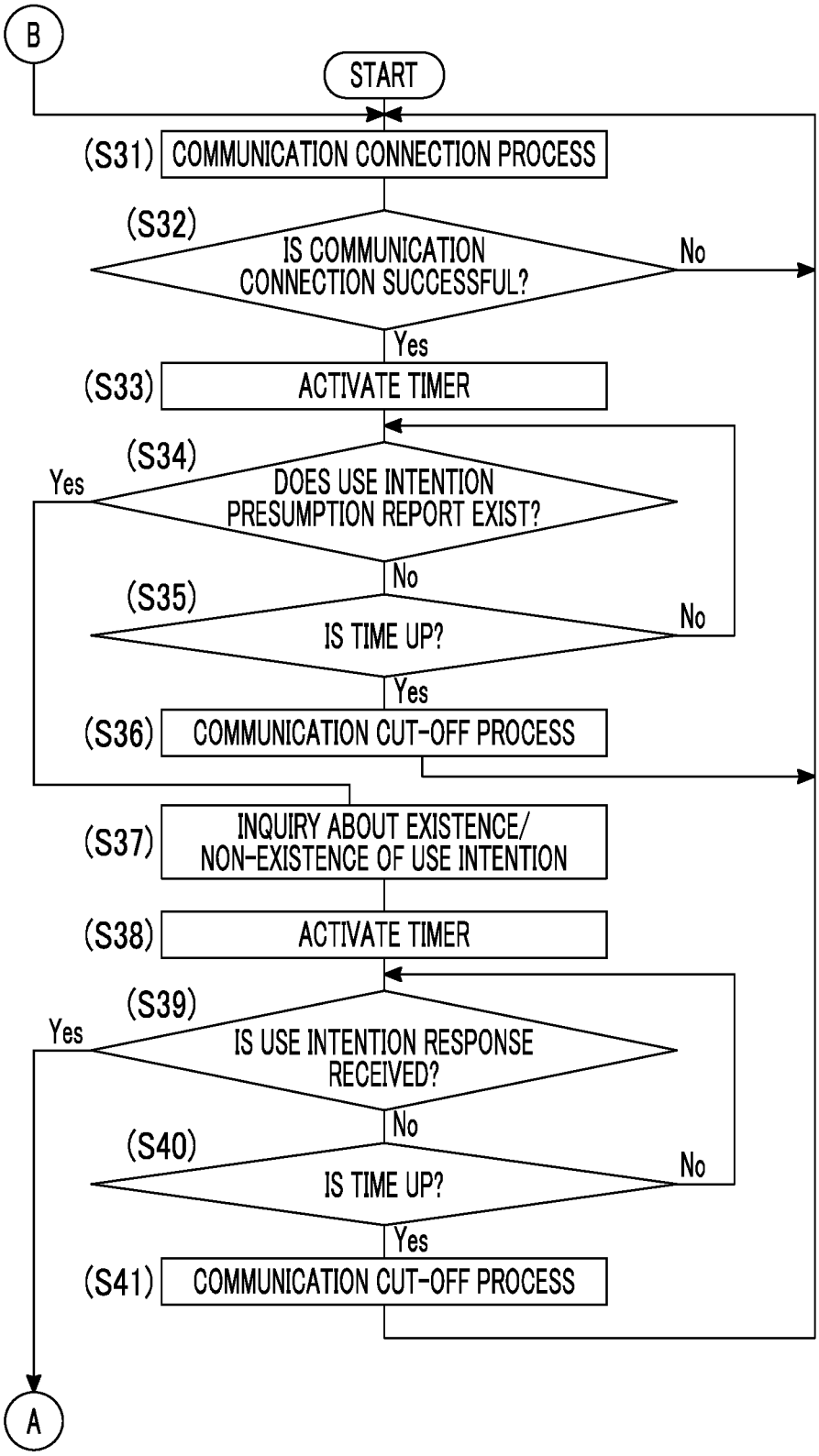

B
START
(S31)
COMMUNICATION CONNECTION PROCESS
(S32)
IS COMMUNICATION CONNECTION SUCCESSFUL?
No
Yes
(S33)
ACTIVATE TIMER
(S34)
Yes
DOES USE INTENTION PRESUMPTION REPORT EXIST?
No
(S35)
IS TIME UP?
No
Yes
(S36)
COMMUNICATION CUT-OFF PROCESS
(S37)
INQUIRY ABOUT EXISTENCE/ NON-EXISTENCE OF USE INTENTION
(S38)
ACTIVATE TIMER
(S39)
Yes
IS USE INTENTION RESPONSE RECEIVED?
No
(S40)
IS TIME UP?
No
Yes
(S41)
COMMUNICATION CUT-OFF PROCESS
A

FIG. 11

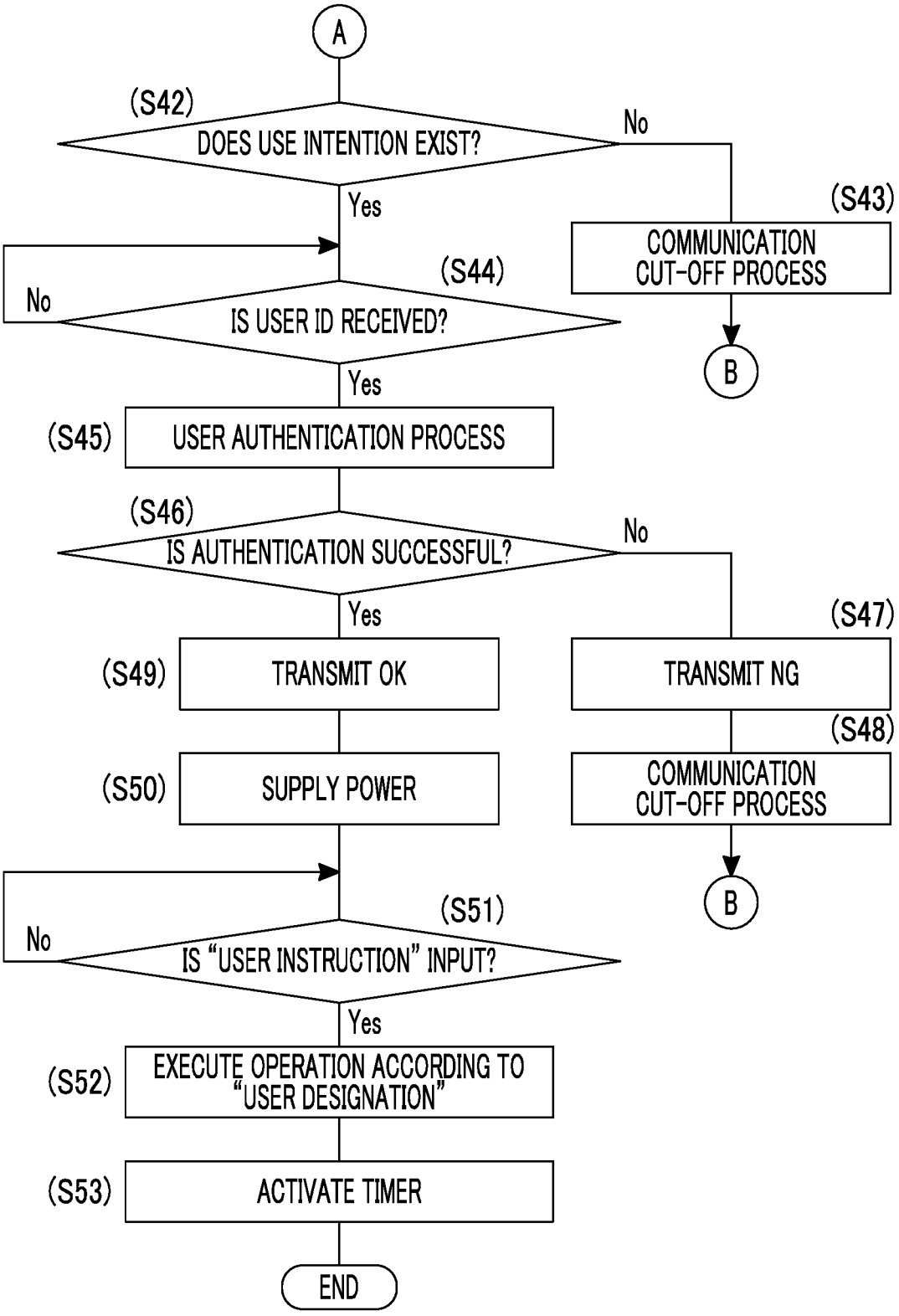

A
(S42)
DOES USE INTENTION EXIST?
No
Yes
(S43)
COMMUNICATION CUT-OFF PROCESS
B
(S44)
No
IS USER ID RECEIVED?
Yes
(S45)
USER AUTHENTICATION PROCESS
(S46)
IS AUTHENTICATION SUCCESSFUL?
No
Yes
(S47)
TRANSMIT NG
(S48)
COMMUNICATION CUT-OFF PROCESS
B
(S49)
TRANSMIT OK
(S50)
SUPPLY POWER
(S51)
No
IS "USER INSTRUCTION" INPUT?
Yes
(S52)
EXECUTE OPERATION ACCORDING TO "USER DESIGNATION"
(S53)
ACTIVATE TIMER
END

FIG. 12

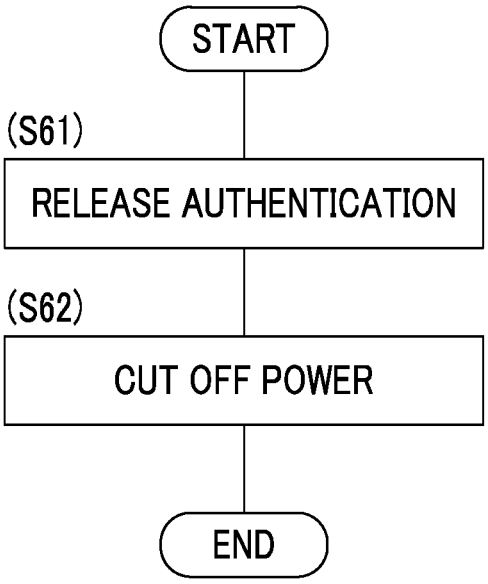
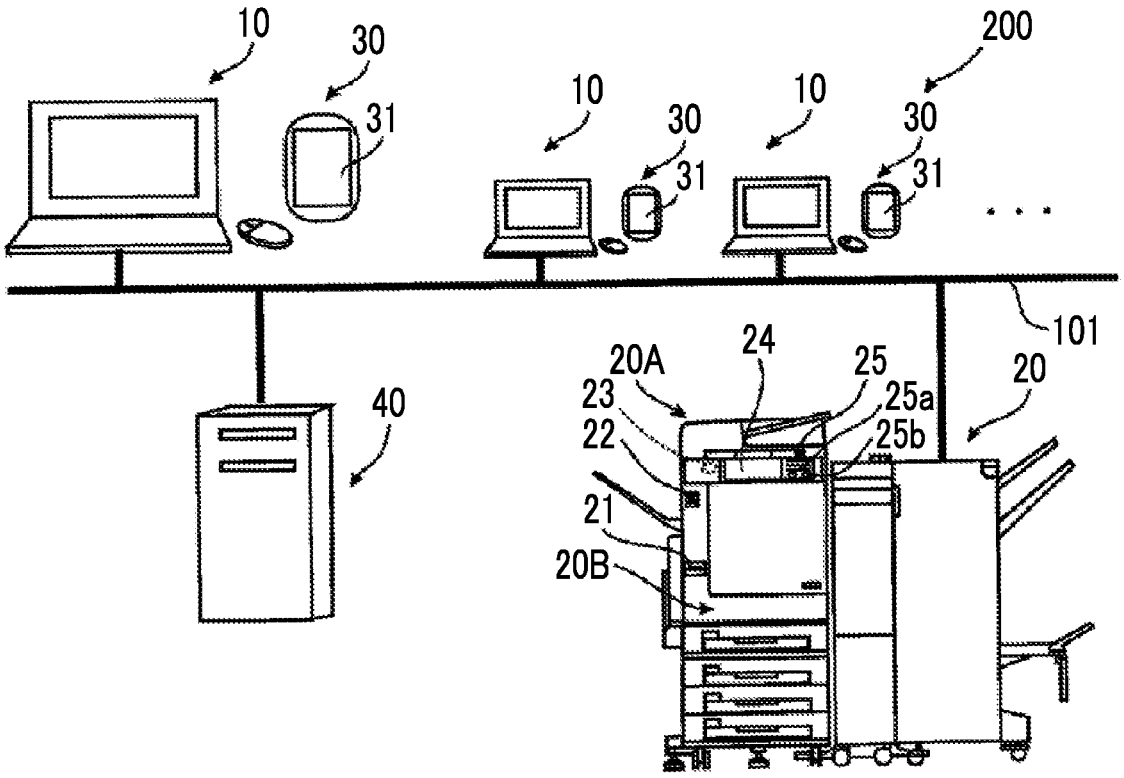


FIG. 13


10
30
31
10
30
31
10
30
31
200
101
40
20A
24
25
20
23
25a
22
25b
21
20B

PROCESSING APPARATUS, MOBILE DEVICE, AND NON-TRANSITORY COMPUTER READABLE MEDIUM STORING AUTHENTICATION REQUEST PROGRAM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2016-244607 filed Dec. 16, 2016.

BACKGROUND

Technical Field

The present invention relates to a processing apparatus, mobile device, and a non-transitory computer readable medium storing an authentication request program.

SUMMARY

According to an aspect of the invention, there is provided a processing apparatus including: a process execution unit that executes a process according to a user instruction; a first communication unit that performs wireless communication with a mobile device which is moved in a predetermined communication area; a recognition unit that recognizes existence/non-existence of use intention in which a user attempts to cause the process execution unit to execute the process; an authentication processing unit that, in cases where the first communication unit receives a user ID maintained in the mobile device through communication with the mobile device and the recognition unit recognizes that the user who possesses the user ID attempts to cause the process execution unit to execute the process, executes a user authentication process of recognizing whether or not the user who has the reception user ID received by the first communication unit is a user who has authority to cause the process execution unit to execute the process for at least a part of necessary authentication process among processes which can be executed by the process execution unit; and a process execution permission unit that, in a case where the reception user ID is recognized by the authentication processing unit as the user ID possessed by the user who has the authority to cause the process execution unit to execute the necessary authentication process, permits the process execution unit to execute the necessary authentication process.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiment(s) of the present invention will be described in detail based on the following figures, wherein:

FIG. **1** is a diagram of a whole configuration of a printing system;

FIG. **2** is a diagram of a hardware configuration of a multi-function machine illustrated in FIG. **1**;

FIG. **3** is a functional block diagram of the multi-function machine illustrated in FIG. **1**;

FIG. **4** is a functional block diagram of a mobile device illustrated in FIG. **1**;

FIG. **5** is a flowchart of a process setting program executed in the mobile device;

FIG. **6** is a diagram illustrating a use intention inquiry screen displayed on a display screen of the mobile device;

FIG. **7** is a diagram illustrating an OK screen displayed in step S**16** of FIG. **5**;

FIG. **8** is a diagram illustrating an NG screen displayed in step S**17** of FIG. **5**;

FIG. **9** is a flowchart illustrating a use intention presumption program which is executed in the multi-function machine;

FIG. **10** is a flowchart illustrating a former part of a process control program;

FIG. **11** is a flowchart illustrating a latter part of the process control program;

FIG. **12** is a flowchart illustrating a power interruption program; and

FIG. **13** is a diagram illustrating another example of the printing system.

DETAILED DESCRIPTION

Hereinafter, exemplary embodiments of the invention will be described.

FIG. **1** is a diagram of a whole configuration of a printing system.

A printing system **100** includes plural note-type personal computers (hereinafter, abbreviated to "notebook PC") **10** and one multi-function machines **20**. Furthermore, each of the notebook PCs **10** and each of the multi-function machines **20** are capable of communicating with each other through a communication circuit **101** such as a wireless Local Area Network (LAN).

In each notebook PC **10**, a print job which instructs to print out is generated, and the print job is transmitted to the multi-function machine **20**. It is possible to cause the print job to include various pieces of attached information, such as the number of copies, distinction between monochrome and color, and a size of paper used to print out, in addition to image data which is basis of printout on paper in the multi-function machine **20**. In addition, the print job includes a user ID of a user who uses the notebook PC **10** of a transmission source.

In addition, the multi-function machine **20** includes a scanner **20**A, a printer **20**B, and the like, and has plural multiple functions such as a function as the scanner, a function as the printer, and a function as a copying machine which combines the scanner and the printer.

In addition, the multi-function machine **20** includes a pyroelectric sensor **21** and a person detection camera **22**.

The pyroelectric sensor **21** is a low power consumption-type sensor which detects infrared rays, and power is always supplied to the pyroelectric sensor **21**. The pyroelectric sensor **21** detects whether or not a person exists at a predetermined distance from the multi-function machine **20**.

The person detection camera **22** is a camera to which power is supplied in a case where existence of a person is detected by the pyroelectric sensor **21** and which mainly captures feet of the person. The multi-function machine **20** analyzes an image of the feet acquired through capturing by the person detection camera **22**, specifies current position of the person based on directions of tips of the feet and the movement of the feet, and, further, detects whether the person approaches the multi-function machine **20** or passes by the multi-function machine **20**.

Furthermore, the multi-function machine **20** includes a short-range communicator **23**. The short-range communicator **23**, is, for example, a wireless communicator conforming to the communication standards such as BLUETOOTH (registered trademark) which has a communication distance of approximately dozens of meters.

Furthermore, the multi-function machine **20** stores a user ID list in which a name and a user ID of the user who has use authority for the multi-function machine **20** are associated.

In addition, FIG. **1** illustrates mobile devices **30** such as smart phones. Each of the mobile devices **30** has a touch panel-type display screen **31**, and has a function of performing communication with the short-range communicator **23** included in the multi-function machine **20**. Each user who uses the printing system **100** is requested to always carry the mobile device **30** of each user. In each mobile device **30**, the user ID of the user who carries the mobile device **30** is registered.

In a case where the multi-function machine **20** receives the print job from the notebook PC **10**, the multi-function machine **20** determines whether or not the print job is a print job which is transmitted by a user who has use authority for the multi-function machine **20** with reference to a user ID included in the print job. In a case of the print job which is transmitted by the user who has the use authority for the multi-function machine **20**, the multi-function machine **20** accumulates the print job in the multi-function machine **20**. Furthermore, in a case where the user who possesses the mobile device **30** approaches the multi-function machine **20**, user authentication is performed through short-range radio communication between the mobile device **30** possessed by the user and the short-range communicator **23** of the multi-function machine **20**. In a case where it is determined to be a user who has use authority for the multi-function machine **20**, printout is performed based on the accumulated print job of the user according to a user instruction. In addition, in a case where the user who arrives at a place of the multi-function machine **20** is the user who has use authority for the multi-function machine **20**, image data, which is acquired through reading of a document by the scanner **20**A according to the user instruction, is transmitted to the notebook PC **10** of the relevant user, and printout is performed based on the image data acquired through the reading.

In addition, the multi-function machine **20** includes a touch panel **24** and a push button group **25** which includes a start button **25***a*, an end button **25***b*, and the like.

Here, the multi-function machine **20** which forms the printing system **100** corresponds to an example of a processing apparatus according to an exemplary embodiment of the invention, and each mobile device **30** corresponds to an example of a mobile device according to the exemplary embodiment of the invention.

FIG. **2** is a diagram illustrating a hardware configuration of the multi-function machine illustrated in FIG. **1**.

Here, the scanner **20**A, the printer **20**B, the pyroelectric sensor **21**, the person detection camera **22**, the short-range communicator **23**, the touch panel **24**, the push button group **25** including various push buttons, such as the start button **25***a* and the end button **25***b*, which are also illustrated in FIG. **1**, are illustrated. Furthermore, here, a main controller **26** is illustrated. The main controller **26** has a function as an information processing apparatus which executes a program. Specifically, the main controller **26** includes a CPU **261**, a ROM **262**, a RAM **263**, an HDD **264**, and a communication I/F **265**. Furthermore, the CPU **261**, the ROM **262**, the RAM **263**, the HDD **264**, and the communication I/F **265** are connected to be capable of communicating with each other through a bus **269**.

The CPU **261** is a central processing unit and executes a program.

The ROM **262** is a read only memory. The ROM **262** stores a part of the program which is executed by the CPU **261**, integers which are referred to by the program, or the like.

In addition, the RAM **263** is a memory in which a program to be executed is read from the HDD **264** and is stored in a case where the program is executed by the CPU **261**. The RAM **263** is used as a work area which stores variables that are necessary in a case where the program is executed, or the like.

In addition, the HDD **264** is a hard disk drive in which a Hard Disk (HD) is built in. The HDD **264** stores various programs which are supposed to be executed by the CPU **261** and various data which are necessary to execute the programs. In addition, the HDD **264** stores the print job or the like which is transmitted from the notebook PC **10** or the like. The user ID which is used to determine existence/non-existence of the use authority for the multi-function machine **20**, a feature quantity of a face of the user, or the like is stored in the HDD **264**.

Furthermore, the communication I/F **265** is a communication interface which performs communication with the notebook PC **10** through the communication circuit **101** illustrated in FIG. **1**.

FIG. **3** is a functional block diagram of the multi-function machine illustrated in FIG. **1**. Here, functions of the multi-function machine **20** will be generally described.

The multi-function machine **20** is a device which is requested to confirm a processing request from the user who has authority to cause the multi-function machine **20** to execute a process, such as print or copy, before execution and which executes a process according to the user instruction.

FIG. **3** illustrates a transmission/reception unit **201**, an accumulation unit **202**, a memory **203**, a communication unit **204**, a detection unit **205**, a recognition unit **206**, an authentication processing unit **207**, a process execution permission unit **208**, an authentication result notification unit **209**, a display/operation unit **210**, a printing unit **211**, a reading unit **212**, and a control unit **219** as functional components of the multi-function machine **20**.

The transmission/reception unit **201** receives a print job which is an instruction to print out and is transmitted from the notebook PC **10** (see FIG. **1**) through the communication circuit **101**. The print job includes the user ID which specifies the user who transmits the print job. The print job received by the transmission/reception unit **201** is transmitted to the accumulation unit **202** through the control unit **219**, and is stored in the accumulation unit **202**. In addition, the transmission/reception unit **201** transmits data, which is read and acquired by the reading unit **212** (scanner **20**A), to the notebook PC **10**. The communication I/F **265** illustrated in FIG. **2** mainly takes a role as the transmission/reception unit **201** on the hardware.

In addition, the accumulation unit **202** accumulates the print job received by the transmission/reception unit **201** until printout is executed by the printing unit **211** based on the print job. The HDD **264** illustrated in FIG. **2** mainly takes a role as the accumulation unit **202** on the hardware.

In addition, the memory **203** stores the user ID list in which a name of each user is associated with a user ID of each user who has use authority to use the multi-function machine **20**. The HDD **264** illustrated in FIG. **2** takes a role as the memory **203** on the hardware. The memory **203** corresponds to an example of a first memory according to the exemplary embodiment of the invention.

In addition, the communication unit **204** performs wireless communication with the mobile device **30** which is possessed by the user, which is in a short distance from the multi-function machine **20**, and which is moved in a predetermined communication area. The short-range communicator **23** illustrated in FIGS. **1** and **2** takes a role as the communication unit **204** on the hardware. The communication unit **204** corresponds to an example of a first communication unit according to the exemplary embodiment of the invention.

In addition, the detection unit **205** separately detects movement of the user according to whether the user passes by the multi-function machine **20** or the user comes toward the multi-function machine **20**. The CPU **261** or the like, which executes a program for distinguishing whether the user passes by the multi-function machine **20** or the user comes toward the multi-function machine **20** based on the pyroelectric sensor **21** and the person detection camera **22**, which are illustrated in FIGS. **1** and **2**, and the directions and movement of the tips of the feet of the user in the image captured by the person detection camera **22**, takes a role as the detection unit **205** on the hardware. The detection unit **205** corresponds to an example of a detection unit according to the exemplary embodiment of the invention.

In addition, a recognition unit **206** recognizes existence/non-existence of "use intention" which indicates that the user attempts to use the multi-function machine **20**. The recognition unit **206** according to the exemplary embodiment recognizes the existence/non-existence of use intention through combination of two recognition processes. One of the recognition processes is a process of recognizing (presuming) that the user has the use intention based on a fact that the user comes toward the multi-function machine **20** is detected by the detection unit **205**. A remaining recognition processes is a process of, in a case where it is recognized (presumed) that the user has the use intention, subsequently, causing the communication unit **204** to transmit an inquiry about the existence/non-existence of use intention toward the mobile device **30** of the user and to receive a reply to the inquiry from the mobile device **30**. Furthermore, in a case where the received reply is a reply indicative of the existence of the existence of the use intention, the recognition unit **206** definitely recognizes that the user has the use intention. The main controller **26**, which includes the CPU **261** or the like that executes a program of performing the recognition process, takes a role as the recognition unit **206** on the hardware.

In addition, in a case where it is recognized that the user has the use intention for the multi-function machine **20** by the recognition unit **206** and the communication unit **204** receives the user ID through communication with the mobile device **30** possessed by the user, the authentication processing unit **207** executes a user authentication process of recognizing whether the user who possesses the user ID is a user who has authority to use the multi-function machine **20** based on the user ID received by the communication unit **204**. The user authentication process according to the exemplary embodiment is a process of determining whether the user ID received by the communication unit **204** is identical (success in recognition) or not (failure in recognition) with any one of the user IDs of the user ID list stored in the memory **203**. A main controller **26**, which includes the CPU **261** or the like that executes a program of performing the user authentication process, takes a role as the authentication processing unit **207** on the hardware. The authentication processing unit **207** corresponds to an example of an authentication processing unit according to the exemplary embodiment of the invention.

In addition, in a case where user authentication performed by the authentication processing unit **207** is successful, that is, it is confirmed that the user ID received by the communication unit **204** is identical to any one of the user IDs in the user ID list stored in the memory **203**, the process execution permission unit **208** permits to execute the process such as print or copy. Similar to the authentication processing unit **207**, the main controller **26** mainly takes a role as the process execution permission unit **208** on the hardware.

Furthermore, the authentication result notification unit **209** causes the communication unit **204** to notify the authentication processing unit **207** of a result of the user authentication process, that is, success or failure in the user authentication to the mobile device **30**, which is a current communication partner, through wireless communication. Similar to the authentication processing unit **207** and the process execution permission unit **208**, the main controller **26** mainly takes a role as the authentication result notification unit **209** on the hardware.

In addition, the display/operation unit **210** takes a role of notifying the user of various pieces of information, through screen display and receiving various instructions from the user through the user operation. Here, the user operation in the display/operation unit **210** includes press of the start button **25***a* which instructs to execute print and copy and press of the end button **25***b* which notifies a fact that the use of the multi-function machine **20** is finished to the multi-function machine **20**. The touch panel **24** and the push button group **25** take a role as the display/operation unit **210** on the hardware.

In addition, the printing unit **211** performs printout on paper. That is, the printing unit **211** performs printout based on the print jobs accumulated in the accumulation unit **202** based on the user instruction. The printer **20**B illustrated in FIGS. **1** and **2** takes a role as the printing unit **211** on the hardware. The printing unit **211** becomes a part of a process execution unit according to the exemplary embodiment of the invention.

In addition, the reading unit **212** takes a role of reading an image on the document and acquiring the image data. The image data acquired by the reading unit **212** is transmitted to the notebook PC **10** through the transmission/reception unit **201** or transmitted to the printing unit **211** and an image is printed out based on the image data. The scanner **20**A illustrated in FIGS. **1** and **2** takes a role as the reading unit **212** on the hardware. The reading unit **212** forms an example of a process execution unit according to the exemplary embodiment of the invention, together with the printing unit **211**.

Furthermore, the control unit **219** is in charge of controlling the whole of the multi-function machine **20** and delivering data and commands.

FIG. **4** is a functional block diagram of the mobile device illustrated in FIG. **1**.

The mobile device **30** is a device which is possessed by the user, maintains a user ID indicating that the user is a user who has use authority to use the multi-function machine **20**, and performs wireless communication with the multi-function machine **20** in a case where the mobile device **30** is moved in a communication area in the vicinity of the multi-function machine **20**. In addition, in the mobile device **30**, a function is embedded as the information processing apparatus which includes the CPU or the like that executes programs, and various programs are executed.

FIG. **4** illustrates a memory **301**, a communication unit **302**, a display **303**, and a control unit **309** as components of the mobile device **30**.

The memory **301** stores the user ID of the user who possesses the mobile device **30**. The memory **301** corresponds to an example of a second memory of the mobile device according to the exemplary embodiment of the invention.

In addition, the communication unit **302** performs wireless communication with the multi-function machine **20** in a case where the mobile device **30** is moved in the communication area with respect to the multi-function machine **20**. Furthermore, the communication unit **302** transmits the user ID stored in the memory **301** to the multi-function machine **20**. The communication unit **302** corresponds to an example of a second communication unit according to the exemplary embodiment of the invention. For example, a short-range communication function, such as BLUETOOTH (registered trademark), included in the mobile device **30** takes a role as the communication unit **302** on the hardware.

Furthermore, the display **303** receives success or failure in the user authentication which is transmitted from the multi-function machine **20** by the communication unit **302**, and displays a result of the success or failure in the user authentication received by the communication unit **302** on the display screen **31**. The CPU or the like, which executes a program of performing display on the display screen **31**, takes a role as the display **303** on the hardware. The display **303** corresponds to an example of a report unit according to the exemplary embodiment of the invention.

Furthermore, the control unit **309** controls the whole of the mobile device **30** and is in charge of delivering data and commands.

Hereinafter, a process executed in the multi-function machine **20** and the mobile device **30** will be described in detail by describing various programs which are executed in the multi-function machine **20** or the mobile device **30**. Here, in description below, a general term of a program which is executed in the multi-function machine **20** corresponds to an example of a process control program according to the exemplary embodiment of the invention, and a general term of a program which is executed in the mobile device **30** corresponds to an example of an authentication request program according to the exemplary embodiment of the invention.

FIG. **5** is a flowchart illustrating the process setting program which is executed in the mobile device.

In the mobile device **30**, whether a target multi-function machine **20** does not exist in the communication area is always monitored by the polling process (step S**01**). Furthermore, in a case where connection of the short-range communication with the target multi-function machine **20** is successful (step S**02**), a state of waiting for reception of the use intention inquiry transmitted from the multi-function machine **20** is made (step S**03**). In the multi-function machine **20**, the use intention inquiry is performed toward the mobile device **30** in step S**37** of FIG. **10** which will be described later.

In a case where the use intention inquiry from the multi-function machine **20** is received (step S**03**), the use intention inquiry screen is displayed on the display screen **31** of the mobile device **30** (step S**04**).

FIG. **6** is a diagram illustrating the use intention inquiry screen displayed on the display screen of the mobile device.

A question "will you use the multi-function machine?" and "Yes" and "No" buttons are displayed on the use intention inquiry screen **311** illustrated in FIG. **6**. In a case where the "Yes" button is pressed, a user intention of attempting to use the multi-function machine **20** is notified to the multi-function machine **20**. In a case where the "No" button, a user intention of not using the current multi-function machine **20** (for example, only passing nearby) is notified to the multi-function machine **20**.

Description will be continued after returning to FIG. **5**.

In a case where the use intention inquiry screen **311** illustrated in FIG. **6** is displayed in step S**04**, subsequently, a timer is activated (step S**05**). The timer is a timer which counts time until the use intention inquiry screen **311** is removed in a case where neither the "Yes" button nor the "No" button is pressed on the use intention inquiry screen **311** displayed on the display screen **31**.

After the timer is activated (step S**05**), whether or not a button operation is performed on the use intention inquiry screen **311** (step S**06**) and whether or not time is up (step S**07**) are monitored. Furthermore, in a case where time is up while the button operation is not performed on the use intention inquiry screen **311**, the use intention inquiry screen **311** is removed (step S**08**). Furthermore, a communication cut-off process is performed (step S**09**), and the process returns to a communication connection process (step S**01**).

Here, in a case where the process directly proceeds to the communication connection process (step S**01**) after the communication cut-off process (step S**09**) is performed, there is a problem in that the user who possesses the mobile device **30**, which is a target of the current communication cut-off process, still stays in the communication area and thus communication with the same mobile device **30** is connected again during the time. Therefore, after the communication cut-off process (step S**09**) is performed, a subsequent communication connection process (step S**01**) is started a little later.

In a case where a screen operation ("Yes" button is pressed or the "No" button is pressed) is performed (step S**06**) while the use intention inquiry screen **311** is displayed on the display screen **31** of the mobile device **30**, the use intention inquiry screen **311** is removed from the display screen **31** in this case (step S**10**), and the existence/non-existence of use intention is replied to the multi-function machine **20** (step S**11**). Meanwhile, in the case where time is up (step S**07**), the reply for the existence/non-existence of use intention is not provided to multi-function machine **20**. However, in this case, it is regarded that the use intention does not exist for the multi-function machine **20**.

In a case where the reply in step S**11** is a reply which indicates the non-existence of the use intention by pressing the "No" button (step S**12**), the process proceeds to step S**09**, and the communication cut-off process is performed, and the communication connection process is started a little later (step S**01**).

In contrast, in a case where the reply in step S**11** is a reply which indicates the existence of the use intention by pressing the "Yes" button (step S**12**), the user ID preserved in the mobile device **30** (stored in the memory **301** illustrated in FIG. **3**) is transmitted to the multi-function machine **20** (step S**13**), and a state of waiting for reception of OK/NG is made (step S**14**). In a case where the multi-function machine **20** receives both the reply of the existence of the use intention of the mobile device **30** and a subsequent user ID are received, a user authentication process of detecting whether or not the same user ID as the received user ID exists in the user ID list of the user who has the use authority for the multi-function machine **20** is executed (step S**45** of FIG. **11**). Furthermore, in a case where the user authentication is successful, "OK" is transmitted to the mobile device **30** (step

S49 of FIG. 11). In contrast, in a case where the user authentication fails, "NG" is transmitted to the mobile device 30 (step S47 FIG. 11).

In a case where the mobile device 30 receives the OK/NG (step S14 of FIG. 5), "OK display" (step S16) or "NG display" (step S17) is performed on the display screen 31 of the mobile device 30 according to whether reception content is "OK" or "NG" (step S15), and notifies a fact that the multi-function machine 20 can be used or cannot be used to the user who possesses the mobile device 30 through the display.

FIG. 7 is a diagram illustrating an OK screen displayed in step S16 of FIG. 5.

On the OK screen 312 illustrated here, a name of a current user (here, Mr. SAZAKI) and a message "You may use this machine.", which permits the use of the multi-function machine 20, are displayed.

In a case where a "remove" button on the OK screen 312 is pressed, the OK screen 312 disappears from the display screen 31 of the mobile device 30.

FIG. 8 is a diagram illustrating an NG screen which is displayed in step S17 of FIG. 5.

A message "Use authority is not confirmed. Please refrain from using" which denies the use of the multi-function machine 20 is displayed on an NG screen 313 illustrated here. In a case where a "remove" button on the NG screen 313 is pressed, the NG screen 313 disappears from the display screen 31 of the mobile device 30.

FIG. 9 is a flowchart illustrating a use intention presumption program which is executed in the multi-function machine.

Here, approach of a person to the multi-function machine 20 is monitored by the pyroelectric sensor 21 illustrated in FIGS. 1 and 2 (step S21). Furthermore, in a case where the approach of a person is detected (step S22), the person detection camera 22 is activated (step S23), and a captured image is analyzed (step S24). Here, a current position and a movement direction of the person are analyzed based on an image acquired by capturing the feet of the person. Furthermore, it is presumed whether the person comes to the multi-function machine 20 and attempts to use the multi-function machine 20 or the person attempts to pass by the multi-function machine 20 based on the analysis.

In a case where it is presumed that the use intention exists (step S25), presumption of the existence of the use intention is reported (step S26).

In contrast, in a case where the person goes away while the presumption of the existence of the use intention is not performed, that is, it is presumed that the person attempts to simply pass by the multi-function machine 20 (step S27), the person detection camera 22 is turned off (step S28), and the process returns to the step of monitoring the approach of a person (step S21).

FIGS. 10 and 11 are flowcharts illustrating the process control program, and illustrating a former part and a latter part, respectively. Similar to the use intention presumption program illustrated in FIG. 9, the process control program is a program which is executed in the multi-function machine 20.

In the multi-function machine 20, in a case where the mobile device 30 which moves in the communication area of the short-range communicator 23 exists, the communication connection process performed with the mobile device 30 is performed (step S31). Furthermore, in a case where communication connection is successful (step S32), the timer is activated (step S33). The timer is a timer used to count a time-limit for use intention presumption report waiting. The use intention presumption report is a report performed in step S26 of the use intention presumption program illustrated in FIG. 9. In a case where the use intention presumption report does not exist until the time-up of the timer activated in step S33 (step S35), the communication cut-off process is performed (step S36), and the process returns to the communication connection process performed with the mobile device 30 (step S31). Here, the mobile device 30, which is a partner in a case where the communication cut-off process is performed in step S36, is excluded from the target of the communication connection process (step S31) for a while. The communication connection process (step S31) performed with another mobile device 30 is immediately started. The communication cut-off process is performed in the same manner in steps S41, S43, and S48 which will be described later.

In a case where the use intention presumption report is provided (step S34) before time of the timer activated in step S33 is up (step S35), an inquiry about the existence/non-existence of the use intention is provided to the mobile device 30 (step S37). In the mobile device 30, in a case where the inquiry about the existence/non-existence of the use intention is provided, the use intention inquiry screen 311 illustrated in FIG. 6 is displayed on the display screen 31 of the mobile device 30 which has received the inquiry (step S04 of FIG. 5), as described above.

After the inquiry about the existence/non-existence of the use intention is performed (step S37), the timer is activated (step S38) on the side of the multi-function machine 20. The timer is a timer used to count a time-limit for response waiting with respect to the inquiry about the existence/non-existence of the use intention (step S37).

In a case where time of the timer activated in step S38 is up (step S40) before a response indicative of the existence/non-existence of the use intention is received (step S39), the communication cut-off process is performed (step S41), and the process returns to the communication connection process in step S31. In contrast, in a case where the response indicative of the existence/non-existence of the use intention is provided (step S39) before time of the timer activated in step S38 is up, it is determined whether the response is a response indicative of the existence of the use intention or a response indicative of the non-existence of the use intention (step S42 of FIG. 11). In a case of the non-existence of the use intention, the communication cut-off process is performed (step S43) similar to the case where the response is not provided, and the process returns to the communication connection process in step S31. In contrast, in a case where the received response is the response indicative of the existence of the use intention (step S42), a state of waiting for reception of the user ID transmitted from the mobile device 30 (step S13 of FIG. 5) is made (step S44). In a case where the user ID is received (step S44), the user authentication process is executed (step S45).

The user authentication process according to the exemplary embodiment is a process of detecting whether or not the same user ID as the received user ID is identical to any one of user IDs, which are registered in the multi-function machine 20 (stored in the memory 203 of FIG. 3) as the users who have authority to use the multi-function machine 20, in the user ID list, determining to be the success in authentication in a case where an identical user ID exists, and determining to be the failure in authentication in a case where the identical user ID is not found.

In a case of the failure in authentication (step S46) as a result of the user authentication process, an NG response relevant to the user ID is transmitted (step S47), further-

more, communication with the currently connected mobile device **30** is cut off (step S**48**), the process returns to step S**31**, and the communication connection process is executed with another mobile device **30**.

In contrast, in a case of the success in authentication (step S**46**) as the result of the user authentication process, an OK response relevant to the user ID is transmitted to the mobile device **30** which is the current communication partner (step S**49**), and power is supplied to the multi-function machine **20** (step S**50**). Meanwhile, as described above, power is always supplied to some spots of the multi-function machine **20**, and thus, here, the supply of power indicates the supply of power to remaining spots.

Subsequently, in a case where the touch panel **24** and the push button group **25** (see FIGS. **1** and **2**) of the multi-function machine **20** are operated by the user, a process which is caused to be executed by the multi-function machine, for example, an instruction (user instruction) for the copy process and the print process is provided. That is, for example, with regard to the copy process, the number of copies, distinction between monochrome and color, a size of paper, and the like are set and, finally, an operation of pressing the start button **25***a* is performed (step S**51**). If so, in the multi-function machine **20**, an operation according to the "user instruction" is executed (step S**52**) with the press of the start button **25***a* as a trigger, and, further, the timer is activated (step S**53**). The timer will be described in subsequent description with reference to FIG. **12**.

FIG. **12** is a flowchart illustrating a power interruption program.

The power interruption program is a program which is executed in the multi-function machine **20** in a case where time of the timer activated in step S**53** of FIG. **11** is up or the end button **25***b* (see FIGS. **1** and **2**) included in the multi-function machine **20** is pressed.

Here, first, the authentication is released (step S**61**). The reason for this is to avoid illegal use of the multi-function machine **20** by another user in a case where power is subsequently supplied to the multi-function machine **20** and information of success in authentication of a previous user remains.

Here, subsequently, power which is supplied to the multi-function machine **20** is cut off (step S**62**). However, as described above, power supply to maintain the communication function or the like with the mobile device **30** is continued.

Here, the user who has used the multi-function machine **20** presses the end button **25***b* in a case where the user leaves the place of the multi-function machine **20**. If so, the power interruption program illustrated in FIG. **12** is executed and power of the multi-function machine **20** is cut off. However, it is conceivable that the user forgets to press the end button **25***b* and leaves the place of the multi-function machine **20**. In this case, the power of the multi-function machine **20** is cut off after waiting for the timer activated in step S**54** of FIG. **11** to time up.

Meanwhile, although not described in the flowchart, for example, it is conceivable that the user leaves while the touch panel **24** is being operated. Therefore, even in a case where predetermined time elapses without performing any operation on the multi-function machine **20**, the power interruption program of FIG. **12** is executed and the power of the multi-function machine **20** is cut off.

Here, in a case of the exemplary embodiment which has been described so far, an image captured by the person detection camera **22** is analyzed, and the existence/non-existence of use intention is recognized (presumed) based on the direction and movement of the tips of the feet of the user. In a case where the existence of the use intention is presumed, subsequently, the inquiry about the existence/non-existence of the use intention is provided to the mobile device **30** of the user, and recognition of the existence/non-existence of use intention is decided based on the reply to the inquiry. However, only the presumption may be used as a process of recognizing the intention of using the multi-function machine **20** or the inquiry about the existence/non-existence of the use intention may be provided to the mobile device **30** of the user, which is moved in the communication area, without performing the presumption.

Subsequently, another form of the user authentication process will be described.

FIG. **13** is a diagram illustrating another example of the printing system.

In a printing system **200** illustrated in FIG. **13** further includes a server **40** in addition to the respective components which form the printing system **100** illustrated in FIG. **1**. The server **40** stores a user ID list, in which a user name and a user ID of a user who has authority to use each multi-function machine **20** are associated, for each multi-function machine **20** which forms the printing system **200** illustrated in FIG. **13**.

In contrast, each multi-function machine **20** does not store the user ID list which indicates use authority for each multi-function machine **20**.

Furthermore, in the printing system **200** illustrated in FIG. **13**, in a case where the communication unit **204** receives the user ID from the mobile device **30**, the authentication processing unit **207** (see FIG. **3**) of each multi-function machine **20** causes the transmission/reception unit **201** to transmit the multi-function machine ID of the multi-function machine **20** and the received user ID to the server **40**, thereby inquiring whether the user ID is a user ID of the user who has authority to use the multi-function machine **20**. In a case where the server **40** receives the inquiry, the server **40** searches the user ID list, which is stored in the server **40** and is relevant to the querying multi-function machine **20**, detects whether or not the same user ID as the inquired user ID exists in the user ID list, and respond a detection result to the querying multi-function machine **20**. The multi-function machine **20**, which performed the inquiry, recognizes the user who possesses the user ID is the user who has authority to use the multi-function machine **20** according to the response.

The server **40** corresponds to an example of an external device according to the exemplary embodiment of the invention.

Here, each exemplary embodiment is configured such that the user authentication process is executed only in a case where the user ID transmitted from the mobile device **30** is received. Therefore, in a case of the above-described exemplary embodiment, it is necessary for the user who attempts to use the multi-function machine **20** to carries the mobile device **30**. A user authentication process (for example, user authentication process using password input, fingerprint authentication, an IC card, and the like) may be executed together by considering a user who does not possess the mobile device **30** or a user who considers that it does not matter even though hours are extended, for example, until the copy operation or the like starts after the user arrives at the place of the multi-function machine **20**.

In addition, in each exemplary embodiment is configured such that it is necessary to execute the user authentication even in a case where any one of the process functions (scan, print, and copy), which is performed by the multi-function

machine **20**, is used. However, it is possible for anyone to use apart of the process functions without performing the user authentication. Even in a configuration in which it is necessary to perform the user authentication for remaining process functions, it is possible to apply the exemplary embodiment of the invention to the process function which requires the user authentication.

Furthermore, here, the multi-function machine **20** illustrated in FIG. **1** or the like is particularly described. However, the exemplary embodiment of the invention is not applied to only the multi-function machine **20** and it is possible to widely apply the exemplary embodiment of the invention to a processing apparatus which executes some processes, in which it is necessary to perform the user authentication, before the process is executed.

The foregoing description of the exemplary embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, thereby enabling others skilled in the art to understand the invention for various embodiments and with the various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

What is claimed is:

1. A processing apparatus comprising:

a process execution unit that executes a process according to a user instruction;

a first communication unit that performs wireless communication with a mobile device which is moved in a predetermined communication area;

a recognition unit that recognizes existence/non-existence of user intention in which a user attempts to cause the process execution unit to execute the process, wherein the recognition unit is configured to determine whether the user moves toward the processing apparatus, and in response to determining that the user moves toward the processing apparatus, the recognition unit causes the first communication unit to transmit the inquiry about the existence/non-existence of use intention to the mobile device which is moved in the predetermined communication area and to receive a reply to the inquiry from the mobile device, and recognizes the existence/non-existence of use intention based on the reply;

an authentication processing unit that, in cases where the first communication unit receives a user ID maintained in the mobile device through communication with the mobile device and the recognition unit recognizes that the user who possesses the user ID attempts to cause the process execution unit to execute the process, executes a user authentication process of recognizing whether or not the user who has the reception user ID received by the first communication unit is a user who has authority to cause the process execution unit to execute the process for at least a part of necessary authentication process among processes which can be executed by the process execution unit; and

a process execution permission unit that, in a case where the reception user ID is recognized by the authentication processing unit as the user ID possessed by the user who has the authority to cause the process execution unit to execute the necessary authentication process, permits the process execution unit to execute the necessary authentication process,

wherein the authentication processing unit inquires of an external device, in which the user ID of the user who has the authority to cause the process execution unit to execute the necessary authentication process is registered, about whether or not the same user ID as the reception user ID received by the first communication unit is registered as the user ID of the user who has the authority to cause the process execution unit to execute the necessary authentication process, and permits the process execution unit to execute the necessary authentication process in a case where the reception user ID is recognized as the user ID possessed by the user who has the authority to cause the process execution unit to execute the necessary authentication process based on a response with respect to the inquiry, as the user authentication process.

2. The processing apparatus according to claim **1**, further comprising:

a first memory that stores the user ID of the user who has the authority to cause the process execution unit to execute the necessary authentication process,

wherein the authentication processing unit determines whether or not the reception user ID received by the first communication unit is identical to any one storage user ID among user IDs stored in the first memory, and permits the process execution unit to execute the necessary authentication process in a case where the reception user ID is identical to the storage user ID, as the user authentication process.

3. The processing apparatus according to claim **2**, wherein the recognition unit causes the first communication unit to transmit the inquiry about the existence/non-existence of use intention to the mobile device which is moved in the communication area and to receive a reply to the inquiry from the mobile device, and recognizes the existence/non-existence of use intention based on the reply.

4. The processing apparatus according to claim **1**,

wherein the recognition unit causes the first communication unit to transmit the inquiry about the existence/non-existence of use intention to the mobile device which is moved in the communication area and to receive a reply to the inquiry from the mobile device, and recognizes the existence/non-existence of use intention based on the reply.

5. The processing apparatus according to claim **2**, further comprising:

a detection unit that separately detects movement of the user according to whether the user passes by the processing apparatus or the user comes toward the processing apparatus,

wherein the recognition unit recognizes that the user has the use intention by detecting that the user comes toward the processing apparatus by the detection unit.

6. The processing apparatus according to claim **1** further comprising:

a detection unit that separately detects movement of the user according to whether the user passes by the processing apparatus or the user comes toward the processing apparatus,

wherein the recognition unit recognizes that the user has the use intention by detecting that the user comes toward the processing apparatus by the detection unit.

7. The processing apparatus according to claim **1**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

8. The processing apparatus according to claim **2**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

9. The processing apparatus according to claim **1**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

10. The processing apparatus according to claim **1**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

11. The processing apparatus according to claim **3**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

12. The processing apparatus according to claim **4**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

13. The processing apparatus according to claim **1**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

14. The processing apparatus according to claim **5**, further comprising:

an authentication result notification unit that causes the first communication unit to notify the mobile device, which is a current communication partner, of a result of the user authentication process in the authentication processing unit, through the wireless communication.

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